

Animated Faces, Abstractions and Autism

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Abstract. The Agent Framework is a real-time development platform designed for the rapid prototyping of graphical and agent-centric applications. Previous use cases show the potential of the Agent Framework, which is currently used in a project that combines facial animation, non-photorealistic rendering and their application in autism research.

Keywords: affective characters, facial animation, real-time, healthcare.

1 Introduction

Along the years, animated characters have found their way to numerous applications in entertainment, human-computer interaction and more recently in medical practices. One of the reasons is the flexibility in the manipulation and customization of these characters, so they could be re-used in different contexts.

This paper presents the Agent Framework, an open-source platform for the rapid creation and prototyping of animated virtual characters, where facial animations and head movements can be manipulated in real-time. In the following, we will introduce previous and current applications developed using the framework, with special emphasis in SARA, a project that brings together facial animation, abstractions and research on Autism.

2 Related Work

The widespread use of animated virtual characters has caused researchers to look for faster and more “comfortable” ways of creating and designing characters, such that it can also be done by non-experts. Nowadays several platforms, commercial and from academia, offer a wide range of functionality in order to create affective and believable characters. Some examples are the work of Magnenat-Thalmann and Thalmann [1], Greta [2], MARC [3], the Augsburg’s Horde3D Game Engine [4], SmartBody [5], or EMBR [6], among many others. Harthold et al. [7] offers a very complete list of frameworks based on the Behavior Markup Language (BML). Jung et al. [8] also offers a very detailed state of the art of models and architectures that have been used for the creation of believable virtual characters.

3 Agent Framework

The Agent Framework is a set of functionalities within our open-source development platform, Frapper, for the creation of application prototypes that involve high-quality animated characters with believable facial animations. On its part, Frapper (Filmakademie Application Framework) [9] arose from the desire to be independent from the other platforms and have complete control over its development. The source code of Frapper is available under GNU LGPL v2.1.

One of the advantages of the Agent Framework is its modular structure, where each functionality is encapsulated in a C++ plugin that can be extended or created according to the developers requirements. In this way, 3rd-party libraries (commercial or not) can be integrated, bringing to the framework new functionalities like speech recognition, voice generation, alternative input devices and so on. For regular users, the framework as it is offers an intuitive node-based interface, where the existent functionalities can be visualized as nodes that can be connected among themselves to create the logic of the application. Fig. 1 depicts a set of nodes of the Agent Framework for emotional facial animation.

Two human-like characters, a young woman (Fig. 1) and an older man are provided with the Agent Framework, under a Creative Commons license. Both are animated using our Facial Animation Toolset (FAT) [10] and the Facial Action Coding System (FACS) [11]. In the case a new character needs to be added, it should be modeled and rigged in an external software (e.g. Maya® or 3Dd Max®) and imported into the framework using the Ogre Maya Exporter.

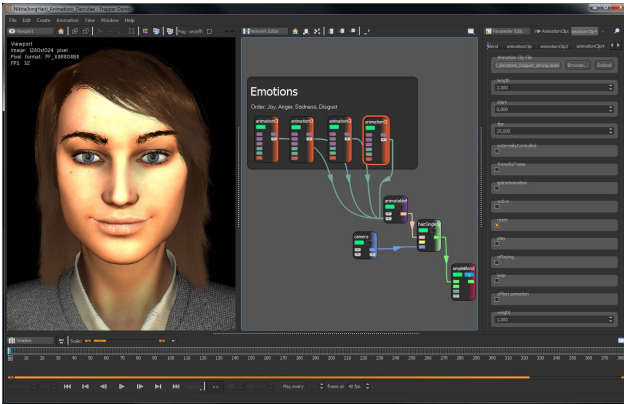


Fig. 1. The Agent Framework in Frapper

4 Applications

The Agent Framework has been successfully used in a number of applications. Together with FAT, an automatic speech recognizer (ASR) SemVox [12] and

text-to-speech (TTS) SVOX [13] (both 3rd party software embedded in the framework), it allowed the creation of affective, interactive and believable characters.

One of the first use cases of the Agent Framework was the creation of Nikita, a “terminal agent conference guide” who not only replied to the questions formulated by the attendees in reference to the conference, but also showed sadness, anger and joy (Fig. 2(a)). The Muses of Poetry [14] is an interactive installation where animated characters transmit to an audience the intrinsic emotions conveyed in existent poems (Fig. 2(b)). Emote [15] is a web based messaging services, which converts plain text messages into animated ones (Fig. 2(c)). The Dynamic Emotion Categorization Test (DECT) [16] was a psychological computer-based experiment where four human actors and two virtual actors (animated characters) were used to examine the ability of emotion recognition with dynamic physical stimuli in children and teenagers with autism (Fig. 2(d)).

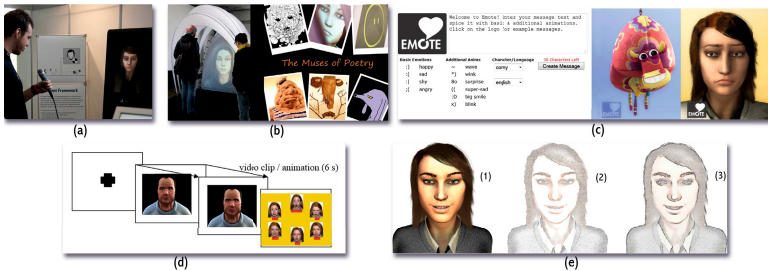


Fig. 2. (a) Conference Guide, (b) Muses of Poetry, (c) Emote, (d) DECT, (e) SARA: (1) Original image, (2) Water Color ‘Joy’, (3) Sketched ‘Joy’

Based on the results achieved with the Agent Framework and the DECT test, SARA - Stylized Animations for Research on Autism intends to take the study of facial recognition in persons with autism to the next level. The goal of SARA is to study how abstraction in animated facial expressions affects their recognition, in comparison to their realistic versions. The abstractions will be implemented through non-photorealistic rendering (NPR) algorithms in order to simulate painting styles like watercolors or sketching. Fig. 2(e)) shows some levels of abstraction in a character expressing “joy”. One of the motivations for SARA was the difficulty in emotions recognition in people with autism, which might be caused by the amount of details conveyed by the human face. Thus, with the Agent Framework the psychologists will have the possibility to abstract and simplify the level of detail of different regions of the face, and adapt them in real-time according to the feedback of the autistic person.

5 Conclusions and Future Work

The Agent Framework offers the users an intuitive interface, while giving the developers a powerful platform where they can add new functions and

integrate new libraries or devices according to the needs of their deployments. The use cases showed the multidisciplinary character of the Agent Framework and its potential in medical fields like autism spectrum disorders (ASD). Moreover, the character animations can be of great aid in therapies and treatments for other conditions like eating or personality disorders, attention deficit, depression and social behavior problems. The current project SARA intends to bring the framework to the next level by offering the possibility to create abstracted facial animations in real-time, with multiple characters at the same time.

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